Agilent Technologies

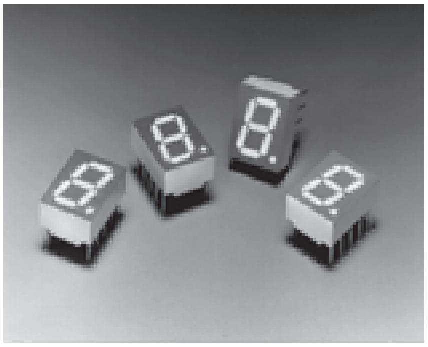
10 mm (0.40 inch) Seven Segment Displays

Technical Data

HDSP-F15x Series
HDSP-F16x Series
HDSP-F20x Series
HDSP-F30x Series
HDSP-F40x Series
HDSP-F50x Series
HDSP-G00x Series
HDSP-G15x Series
HDSP-G20x Series
HDSP-G30x Series
HDSP-G40x Series
HDSP-G50x Series

Features

- **Industry Standard Size**
- **Industry Standard Pinout**
  7.6 mm (0.3 inch) DIP Single
  15.24 mm (0.6 inch) DIP Dual
  Leads on 2.54 mm
  (0.1 inch) Centers
- **Choice of Colors**
  AlGaAs Red, High Efficiency Red, Orange, Yellow, Green
- **Excellent Appearance**
  Evenly Lighted Segments
  Mitered Corners on Segments
  Gray Package Gives Optimum Contrast
  Black Surface and Color Tinted Epoxy (HDSP-F161 only)
  ± 50° Viewing Angle
- **Design Flexibility**
  Common Anode or
  Common Cathode
  Single and Dual Digits
  Right Hand Decimal Point
  ± 1. Overflow Character
- **Categorized for Luminous Intensity**
  Yellow and Green Categorized for Color
  Use of Like Categories Yields a Uniform Display
- **High Light Output**
- **High Peak Current**
- **Excellent for Long Digit String Multiplexing**



- **Intensity and Color Selection Option**
- **Sunlight Viewable AlGaAs**

Devices

AlGaAs Red[1] HDSP-	HER HDSP-	Orange HDSP-	Yellow HDSP-	Green HDSP-	Description	Package Drawing
F151	F201	F401	F301	F501	Common Anode Right Hand Decimal	A
F161					Common Anode Right Hand Decimal	A
F153	F203	F403	F303	F503	Common Cathode Right Hand Decimal	B
F157	F207	F407	F307	F507	Common Anode ± 1. Overflow	C
F158	F208	F408	F308	F508	Common Cathode ± 1. Overflow	D
G151	G201	G401	G301	G501	Two Digit Common Anode Right Hand Decimal	E
G153	G203	G403	G303	G503	Two Digit Common Cathode Right Hand Decimal	F

Note:
1. These displays are recommended for high ambient light operation. Please refer to the HDSP-F10X data sheet for low current operation.

Part Numbering System

5082 - x xx x - x x x xx
HDSP - x xx x - x x x xx

- **Mechanical Options**[1]
  00: No mechanical option
  16: Special dimensional tolerances
- **Color Bin Options**[1,2]
  0: No color bin limitation
- **Maximum Intensity Bin**[1,2]
  0: No maximum intensity bin limitation
- **Minimum Intensity Bin**[1,2]
  0: No minimum intensity bin limitation
- **Device Configuration/Color**[1]
  1: Common Anode
  3: Common Cathode
- **Device Specific Configuration**[1]
  Refer to respective data sheet
- **Package**[1]
  F: 10 mm (0.4 inch) Single Digit Seven Segment Display
  G: 10 mm (0.4 inch) Dual Digit Seven Segment Display

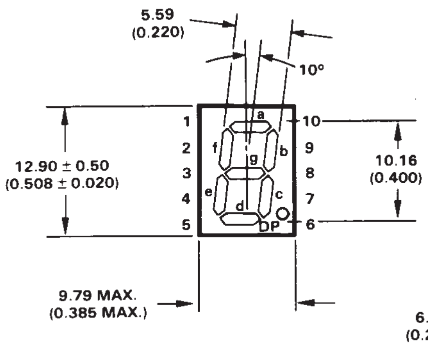
Notes:
1. For codes not listed in the figure above, please refer to the respective data sheet or contact your nearest Agilent representative for details.
2. Bin options refer to shippable bins for a part-number. Color and Intensity Bins are typically restricted to 1 bin per tube (exceptions may apply). Please refer to respective data sheet for specific bin limit information.

Description

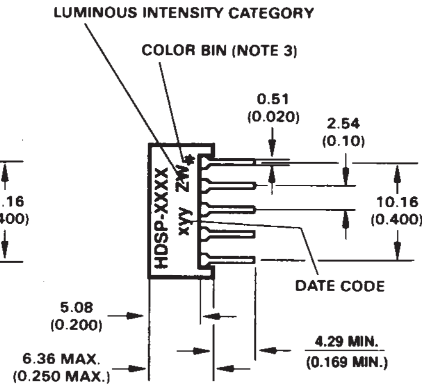
The 10 mm (0.40 inch) LED seven segment displays are Agilent's most space-efficient character size. They are designed for viewing distances up to 4.5 metres (15 feet). These devices use an industry standard size package and pinout. The dual numeric, single numeric, and ± 1. overflow devices feature a right hand decimal point. All devices are available as either common anode or common cathode.

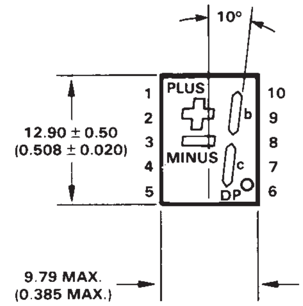
Typical applications include instruments, point of sale terminals, and appliances.

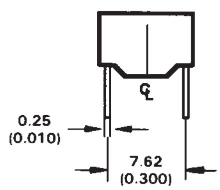
Package Dimensions



FRONT VIEW A, B

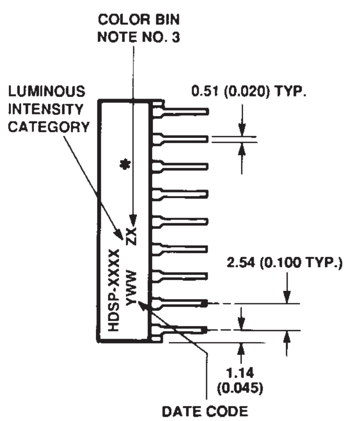






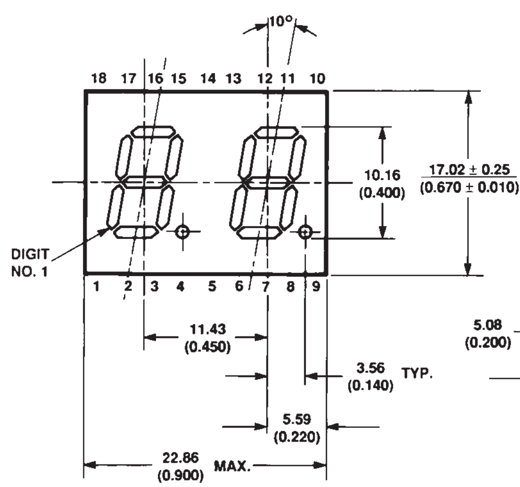
TOP END VIEW A, B, C, D

*The End View of package indicates Country of Origin.

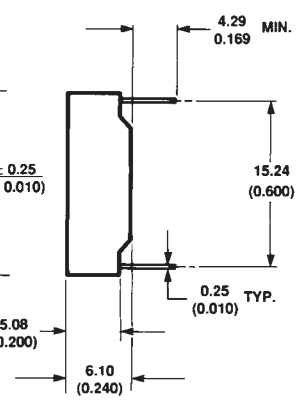


TOP END VIEW E, F

* The End View of package indicates Country of Origin.

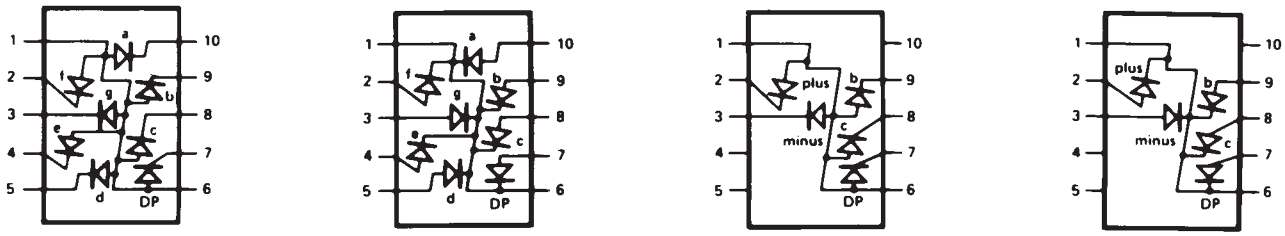


FRONT VIEW E, F

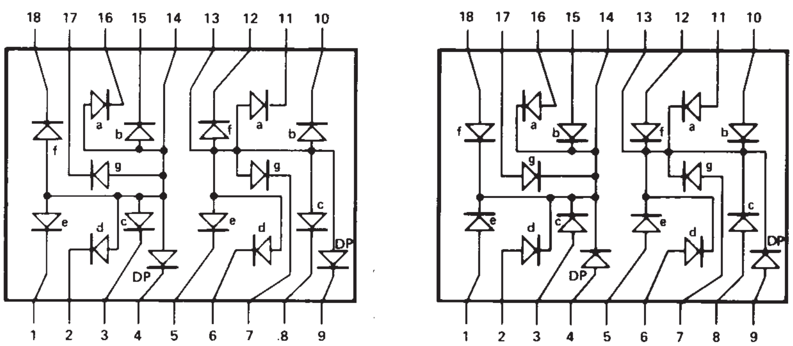


NOTES:
1. DIMENSIONS ARE IN MILLIMETRES (INCHES).
2. ALL UNTOLERANCED DIIMENSIONS ARE FOR REFERENCE ONLY.
3. WHERE APPLICABLE.

Internal Circuit Diagram



A B C D

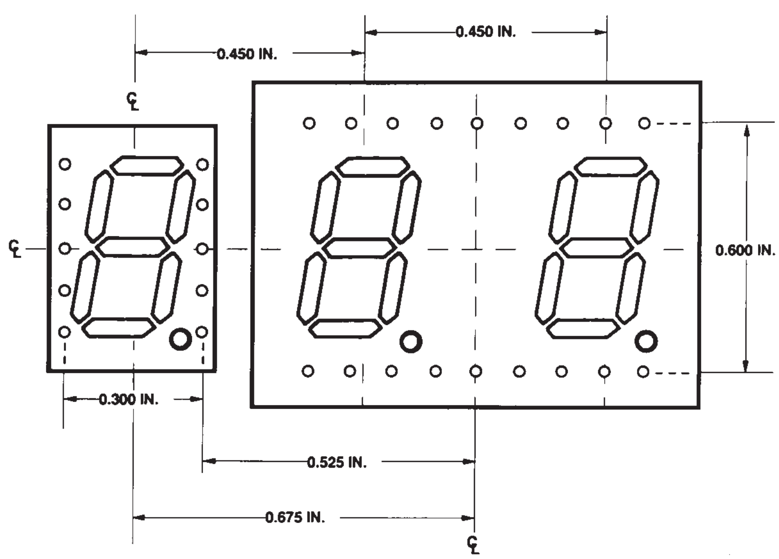


E F

PIN	FUNCTION			
	A	B	C	D
1	ANODE[1]	CATHODE[2]	ANODE[1]	CATHODE[2]
2	CATHODE f	ANODE f	CATHODE PLUS	ANODE PLUS
3	CATHODE g	ANODE g	CATHODE MINUS	ANODE MINUS
4	CATHODE e	ANODE e	NC	NC
5	CATHODE d	ANODE d	NC	NC
6	ANODE[1]	CATHODE[2]	ANODE[1]	CATHODE[2]
7	CATHODE DP	ANODE DP	CATHODE DP	ANODE DP
8	CATHODE c	ANODE c	CATHODE c	ANODE c
9	CATHODE b	ANODE b	CATHODE b	ANODE b
10	CATHODE a	ANODE a	NC	NC

NOTES:
1. REDUNDANT ANODES
2. REDUNDANT CATHODES

PIN	FUNCTION	
	E	F
1	E CATHODE NO. 1	E ANODE NO. 1
2	D CATHODE NO. 1	D ANODE NO. 1
3	C CATHODE NO. 1	C ANODE NO. 1
4	DP CATHODE NO. 1	DP ANODE NO. 1
5	E CATHODE NO. 2	E ANODE NO. 2
6	D CATHODE NO. 2	D ANODE NO. 2
7	G CATHODE NO. 2	G ANODE NO. 2
8	C CATHODE NO. 2	C ANODE NO. 2
9	CP CATHODE NO. 2	DP ANODE NO. 2
10	B CATHODE NO. 2	B ANODE NO. 2
11	A CATHODE NO. 2	A ANODE NO. 2
12	F CATHODE NO. 2	F ANODE NO. 2
13	DIGIT NO. 2 ANODE	DIGIT NO. 2 CATHODE
14	DIGIT NO. 1 ANODE	DIGIT NO. 1 CATHODE
15	B CATHODE NO. 1	B ANODE NO. 1
16	A CATHODE NO. 1	A ANODE NO. 1
17	G CATHODE NO. 1	G ANODE NO. 1
18	F CATHODE NO. 1	F ANODE NO. 1



HOLE PATTERN FOR PCB LAYOUT TO ACHIEVE UNIFORM 0.450 IN. DIGIT TO DIGIT PITCH. FOR HDSP-FXXX TO HDSP-GXXX.

Absolute Maximum Ratings

Description	AlGaAs Red HDSP-F15x/F16x G15x Series	HER/Orange HDSP-F20x/G20x/G40x Series	Yellow HDSP-F30x/G30x Series	Green HDSP-F50x/G50x Series	Units
Average Power per Segment or DP	96	105	80	105	mW
Peak Forward Current per Segment or DP	160[1]	90[3]	60[5]	90[7]	mA
DC Forward Current per Segment or DP	40[2]	30[4]	20[6]	30[8]	mA
Operating Temperature Range	–20 to +100[9]	–40 to +100			°C
Storage Temperature Range	–55 to +100				°C
Reverse Voltage per Segment or DP	3.0				V
Wavesoldering Temperature for 3 Seconds (1.59 mm [0.063 in.] below body)	250				°C

Notes:
1. See Figure 1 to establish pulsed conditions.
2. Derate above 46°C at 0.54 mA/°C.
3. See Figure 6 to establish pulsed conditions.
4. Derate above 53°C at 0.45 mA/°C.
5. See Figure 7 to establish pulsed conditions.
6. Derate above 81°C at 0.52 mA/°C.
7. See Figure 8 to establish pulsed conditions.
8. Derate above 39°C at 0.37 mA/°C.
9. For operation below -20°C, contact your local Agilent components sales office or an authorized distributor.

Electrical/Optical Characteristics at T_A = 25°C

AlGaAs Red

Device Series	Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
HDSP-F15x/F16x/G15x	Luminous Intensity/Segment[1, 2, 5] (Digit Average)	I_V	7.5	15.0		mcd	I_F = 20 mA
	Forward Voltage/Segment or DP	V_F		1.8	2.2	V	I_F = 20 mA
	Peak Wavelength	λ_{PEAK}		645		nm	
	Dominant Wavelength[3]	λ_d		637		nm	
	Reverse Voltage/Segment or DP[4]	V_R	3.0	15		V	I_R = 100 µA
	Temperature Coefficient of V_F/Segment or DP	ΔV_F/°C		-2		mV/°C	
	Thermal Resistance LED Junction-to-Pin	$R\theta_{J\text{-}PIN}$		320		°C/W/Seg	

Electrical/Optical Characteristics at T_A = 25°C, continued

High Efficiency Red

Device Series	Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
	Luminous Intensity/Segment[1,2] (Digit Average)	I_V	420	1200		µcd	I_F = 5 mA
	Forward Voltage/Segment or DP	V_F		2.0	2.5	V	I_F = 20 mA
HDSP-F20x/G20x	Peak Wavelength	λ_{PEAK}		635		nm	
	Dominant Wavelength[3]	λ_d		626		nm	
	Reverse Voltage/Segment or DP[4]	V_R	3.0	30		V	I_R = 100 µA
	Temperature Coefficient of V_F/Segment or DP	ΔV_F/°C		-2		mV/°C	
	Thermal Resistance LED Junction-to-Pin	$R\theta_{J-PIN}$		320		°C/W/Seg	

Orange

Device Series	Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
	Luminous Intensity/Segment[1,2] (Digit Average)	I_V	420	1200		µcd	I_F = 5 mA
	Forward Voltage/Segment or DP	V_F		2.0	2.5	V	I_F = 20 mA
HDSP-F40x/G40x	Peak Wavelength	l_{PEAK}		600		nm	
	Dominant Wavelength[3]	l_d		603		nm	
	Reverse Voltage/Segment or DP[4]	V_R	3.0	30		V	I_R = 100 µA
	Temperature Coefficient of V_F/Segment or DP	ΔV_F/°C		-2		mV/°C	
	Thermal Resistance LED Junction-to-Pin	Rl\q$_{J-PIN}$		320		°C/W/Seg	

Electrical/Optical Characteristics at T_A = 25°C, continued

Yellow

Device Series	Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
HDSP-F30x/G30x	Luminous Intensity/Segment[1,2] (Digit Average)	I_V	290	800		µcd	I_F = 5 mA
	Forward Voltage/Segment or DP	V_F		2.2	2.5	V	I_F = 20 mA
	Peak Wavelength	λ_{PEAK}		583		nm	
	Dominant Wavelength[3,6]	λ_d	581.5	586	592.5	nm	
	Reverse Voltage/Segment or DP[4]	V_R	3.0	40		V	I_R = 100 µA
	Temperature Coefficient of V_F/Segment or DP	ΔV_F/°C		-2		mV/°C	
	Thermal Resistance LED Junction-to-Pin	$R\theta_{J\text{-}PIN}$		320		°C/W/Seg	

High Performance Green

Device Series	Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
HDSP-F50x/G50x	Luminous Intensity/Segment[1,2] (Digit Average)	I_V	1030	3500		µcd	I_F = 10 mA
	Forward Voltage/Segment or DP	V_F		2.1	2.5	V	I_F = 10 mA
	Peak Wavelength	λ_{PEAK}		566		nm	
	Dominant Wavelength[3,6]	λ_d		571	577	nm	
	Reverse Voltage/Segment or DP[4]	V_R	3.0	50		V	I_R = 100 µA
	Temperature Coefficient of V_F/Segment or DP	ΔV_F/°C		-2		mV/°C	
	Thermal Resistance LED Junction-to-Pin	$R\theta_{J\text{-}PIN}$		320		°C/W/Seg	

Notes:
1. Case temperature of device immediately prior to the intensity measurement is 25°C.
2. The digits are categorized for luminous intensity. The intensity category is designated by a letter on the side of the package.
3. The dominant wavelength, λ_d, is derived from the CIE chromaticity diagram and is that single wavelength which defines the color of the device.
4. Typical specification for reference only. Do not exceed absolute maximum ratings.
5. For low current operation, the AlGaAs HDSP-F10X, G10X series displays are recommended. They are tested at 1 mA dc/segment and are pin for pin compatible with the HDSP-F15X/F16x/G15X series.
6. The Yellow (HDSP-F30X/G30X) series and Green (HDSP-F50X/G50X) series displays are categorized for dominant wavelength. The category is designated by a number adjacent to the luminous intensity category letter.

AlGaAs Red

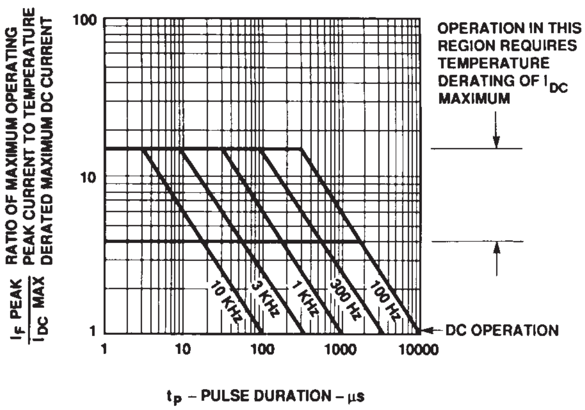


Figure 1. Maximum Tolerable Peak Current vs. Pulse Duration – AlGaAs Red.

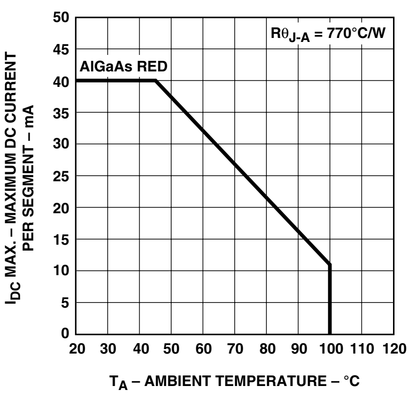


Figure 2. Maximum Allowable DC Current vs. Ambient Temperature.

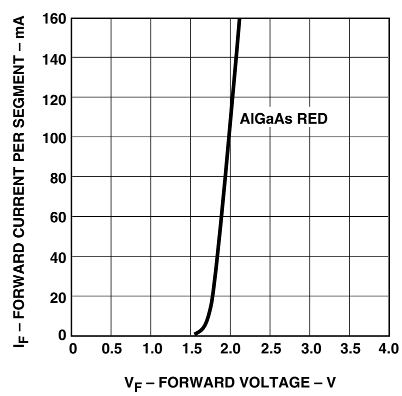


Figure 3. Forward Current vs. Forward Voltage.

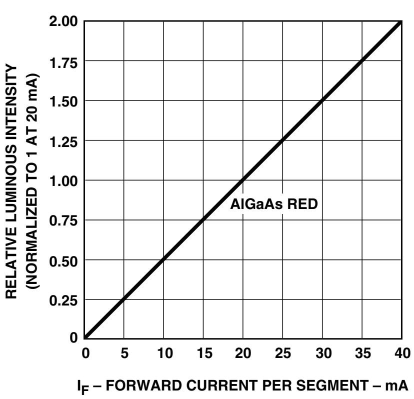


Figure 4. Relative Luminous Intensity vs. DC Forward Current.

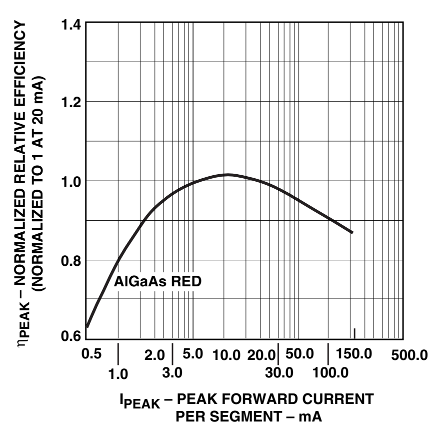


Figure 5. Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current.

HER, Orange, Yellow, Green

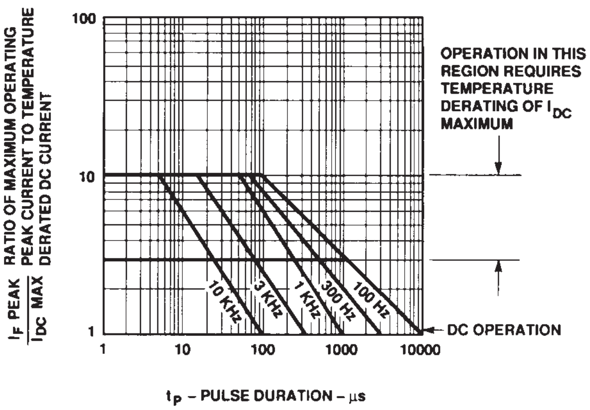


Figure 6. Maximum Tolerable Peak Current vs. Pulse Duration – HER, Orange.

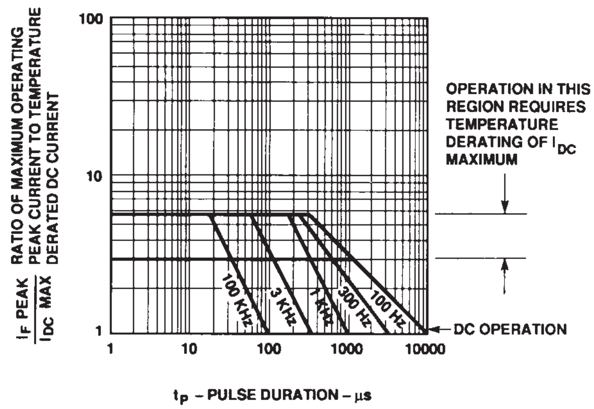


Figure 7. Maximum Tolerable Peak Current vs. Pulse Duration – Yellow.

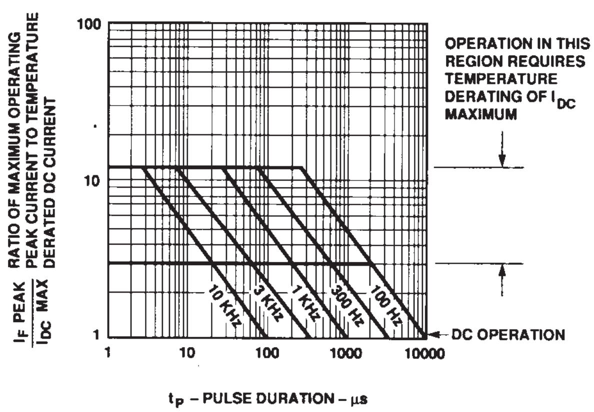


Figure 8. Maximum Tolerable Peak Current vs. Pulse Duration – Green.

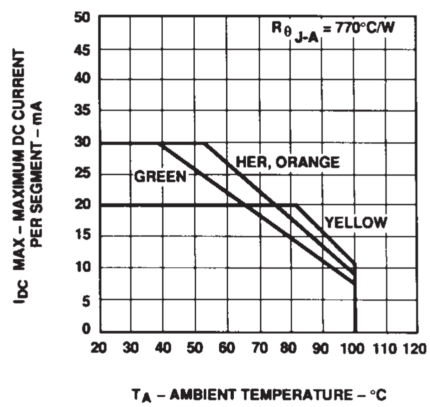


Figure 9. Maximum Allowable DC Current vs. Ambient Temperature.

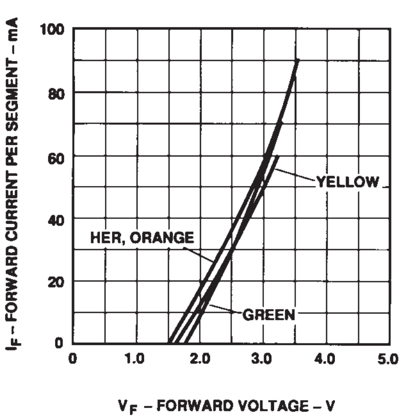


Figure 10. Forward Current vs. Forward Voltage Characteristics.

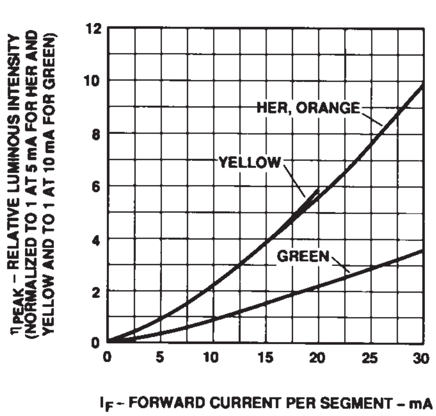


Figure 11. Relative Luminous Intensity vs. DC Forward Current.

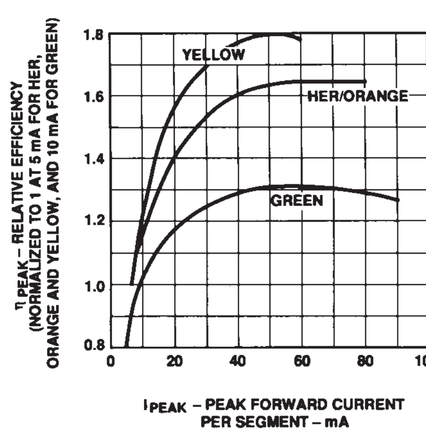


Figure 12. Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current.

Intensity Bin Limits (mcd)

AlGaAs Red

HDSP-F15x/F16x/G15x		
IV Bin Category	Min.	Max.
L	8.67	15.90
M	13.00	23.80
N	19.50	35.80
O	29.30	53.60
P	43.90	80.50

HER/Orange

HDSP-F20x/G20x/F40x/G40x		
IV Bin Category	Min.	Max.
C	0.485	0.890
D	0.728	1.333
E	1.091	2.000
F	1.636	3.000
G	2.454	4.500
H	3.682	6.751

Yellow

HDSP-F30x/G30x		
IV Bin Category	Min.	Max.
C	0.297	0.543
D	0.445	0.817
E	0.669	1.225
F	1.003	1.838
G	1.504	2.758
H	2.256	4.137

Green

HDSP-F50x/G50x		
IV Bin Category	Min.	Max.
H	1.54	2.82
I	2.31	4.23
J	3.46	6.34
K	5.18	9.50
L	7.78	14.26

Color Categories

Color	Bin	Dominant Wavelength (nm)	
		Min.	Max.
Yellow	1	581.50	585.00
	3	584.00	587.50
	2	586.50	590.00
	4	589.00	592.50
Green	2	573.00	577.00
	3	570.00	574.00
	4	567.00	571.00
	5	564.00	568.00

Note:
All categories are established for classification of products. Products may not be available in all categories. Please contact your local Agilent representatives for further clarification/information.

Contrast Enhancement

For information on contrast enhancement, please see Application Note 1015.

Soldering/Cleaning

Cleaning agents from the ketone family (acetone, methyl ethyl ketone, etc.) and from the chlorinated hydrocarbon family (methylene chloride, trichloroethylene, carbon tetrachloride, etc.) are not recommended for cleaning LED parts. All of these various solvents attack or dissolve the encapsulating epoxies used to form the package of plastic LED parts.

For further information on soldering LEDs, please refer to Application Note 1027.

Agilent Technologies

www.agilent.com/semiconductors
For product information and a complete list of distributors, please go to our web site.

For technical assistance call:

Americas/Canada: +1 (800) 235-0312 or (916) 788-6763

Europe: +49 (0) 6441 92460

China: 10800 650 0017

Hong Kong: (+65) 6756 2394

India, Australia, New Zealand: (+65) 6755 1939

Japan: (+81 3) 3335-8152 (Domestic/International), or 0120-61-1280 (Domestic Only)

Korea: (+65) 6755 1989

Singapore, Malaysia, Vietnam, Thailand, Philippines, Indonesia: (+65) 6755 2044

Taiwan: (+65) 6755 1843

Data subject to change.

Obsoletes 5988-2222EN
February 2, 2005
5989-2346EN